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ABSTRACT

The Hawaii Legislature asked the Office of the Auditor to examine two major Department of Education computer projects--a financial management system (FMS) and a student information and program management system (SIPMS). It also requested guidelines for use in evaluating funding requests for future projects. A 1-year implementation delay in the FMS project has resulted in unused training facilities and equipment, additional consultant fees, and unreliable completion cost estimates. These problems were caused by major shortcomings in the development and procurement process. Still in the early planning stage, the SIPMS project has completed a preliminary plan and a requirements definition. The plan, which proposes a "staged" approach, will take 6 years and $23.8 million to complete. The estimated $3.3 million for the first 2 years is realistic, although auditors cannot comment on the remaining $20.5 million covering construction and implementation costs. The FMS project should: (1) agree on software capacities, critical requirements, and capabilities needed before full implementation; (2) develop a work plan; and (3) define project responsibilities and agree on remaining task assignments. The SIPMS project should continue its phased implementation approach and use existing hardware and software as much as possible. Legislature requests for funding such projects should be in understandable language. (MLH)

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Study of the Development of the Department of Education's Financial Management System and Student Information and Program Management System

A Report to the Governor and the Legislature of the State of Hawaii

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STATE OF HAWAII

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Under its assigned missions, the office conducts the following types of examinations:

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Study of the Development of the Department of Education's Financial Management System and Student Information and Program Management System

A Report to the Governor and the Legislature of the State of Hawaii

Conducted by
Price Waterhouse

Submitted by

THE AUDITOR
STATE OF HAWAII

Report No. 91-2
January 1991

Foreword

In the Supplemental Appropriations Act of 1990, the Hawaii State Legislature requested the auditor to conduct a study of two major computer systems projects of the Department of Education, a financial management system and a student information and program management system.

The Advanced Information Technology Group of the firm of Price Waterhouse was selected to conduct the study. The consultant conducted the fieldwork and analysis for the study and prepared the final report. Our office participated in the review of the final report.

We join Price Waterhouse in expressing our appreciation for the excellent cooperation and assistance extended by officials and staff of the Department of Education.

Newton Sue
Acting Auditor
State of Hawaii

January 1991

Table of Contents

Chapter 1 Introduction

Objectives of the Study 1
Scope of the Study 1
Methodology 2
Organization of the Report 3

Chapter 2 Background and Status of the FMS Project

History of the FMS 5
System Development Process 6
Department's System Development Process 9
Financial Status of the Project 12

Chapter 3 Shortcomings of the FMS Project

Summary of Findings 15
Selection of Software Package 15
Requirements Definition 17
Critical Checkpoints in Design Phase 19
Involvement of Department Personnel 20
Procurement Practices 21
Recommended Course of Action 22

Chapter 4 Student Information and Program Management System

History of the SIPMS 25
Project Status 26
Relationship Between FMS and SIPMS 26
Estimated Costs for the SIPMS 27
Recommendations to the Department 28

Chapter 5 Guidelines for Legislative Review

Review of Request for a Major Computer System 29
Review Annual Status Reports 30

Response of the Affected Agency 31

List of Tables

Table 2.1: Appropriations for the FMS Project 6
Table 2.2: Expenditures for the FMS Project 12

Chapter 1
Introduction

This is a report on the study of two major computer projects undertaken by the Department of Education, the state's largest department with 20,000 employees and 237 schools. The projects are a financial management system (FMS) and a student information and program management system (SIPMS). The Legislature requested the study in Section 5(77) of the Supplemental Appropriations Act of 1990 (Act 299). The request reflected concern as to whether funds appropriated for these projects were appropriately and efficiently expended. Accordingly, the Legislature requested the auditor to examine the projects in their totality, identify areas of concern, and provide practical and feasible alternatives to allow the projects to meet their goals. The auditor was also asked to suggest guidelines by which the Legislature can evaluate funding requests for major computer systems in the future.

The department's undertaking of these two projects culminates several years of advocating the need for new computer technology in its financial, student information, and program management operations. The effort to computerize its operations accelerated in 1986 after the Legislature granted administrative flexibility to the department in budgeting and fiscal operations. This flexibility allowed the department to manage all aspects of its fiscal operations, with the exception of payroll, outside the State's centralized accounting control system. The movement to decentralize decision making, generally called "school/community-based management," also heightened the push to computerize more operations. The department maintains that decentralization has increased the need to provide readily accessible information and accountability at all levels of the organization.

Objectives of the Study

1. Determine the adequacy of the plans for and implementation of FMS and SIPMS and to make recommendations for improvements.

2. Develop guidelines for the Legislature in reviewing funding requests for major computer systems.

Scope of the Study

Section 5(77) of Act 299 requires that the study include, but not be limited to, the following:

1) review the plans and planning efforts of the department for both projects;

2) review the implementation of FMS to include selection of software and hardware, assessment of consulting services, and revisions in implementation plans;

3) review the relationship between FMS and SIPMS, and any plans for integration;

4) report on past funding and expenditures for both projects and projections of future costs;

5) determine compliance with applicable state laws;

6) identify any flaws in core planning or implementation that have resulted, or will result, in substantial negative fiscal or operational impact, and make recommendations for improvement to minimize or correct the negative impacts.

Section 5(77) of Act 299 also requires the study to develop general guidelines to assist the Legislature in reviewing funding requests from agencies for major computer systems.

Methodology

We conducted this study using a fact-finding and analysis approach. During the fact-finding phase we interviewed individuals involved in the FMS and SIPMS projects. Among those interviewed were the deputy superintendent of the Department of Education, the FMS project manager, the FMS technical manager, the FMS consultants, the SIPMS consultant, and the director of the Information and Communication Systems Division of the Department of Budget and Finance. We also attended the final SIPMS "requirements definition" meeting between the consultant and the user group.

We reviewed documentation for all phases of the project. We also reviewed the state's strategic plans for data processing as described in the Distributed Information Processing and Information Resource Management (DIPIRM) master plan. We reviewed the department's strategic plans for data processing as described in the department's 1988 and 1990 DIPIRM plans. Other documents included project status reports, project correspondence files, project worksheets on cost, purchase orders, contracts, and official departmental accounting reports.

During the analysis phase of the study we evaluated the information obtained during the fact-finding phase against system development

methodology and standards followed by the State as well as implementation standards followed by the data processing industry.

The fieldwork was conducted from July 1990 to August 1990 in accordance with generally accepted government auditing standards.

Organization of the Report

Chapter 1 is this introduction. Chapter 2 provides the background and status of the FMS project. Chapter 3 identifies and discusses shortcomings with the FMS project and presents our recommended course of action. Chapter 4 provides comments and recommendations on the SIPMS project. Chapter 5 presents our recommendations for the Legislature to use in evaluating funding requests for major computer systems.

Chapter 2

Background and Status of the FMS Project

We first present a brief history of the Department of Education's financial management system (FMS) project. We then describe both the process generally followed by the data processing industry in developing major computer systems and the process used by the department in developing the financial management system. Last of all, we present the financial status of the project.

History of the FMS

In 1987, the department initiated a study of its existing financial management system with the intention of evaluating the system and recommending improvements. The study was conducted with the assistance of IBM. The results were presented in a report entitled *Financial Management System Study*, commonly referred to as the "green book." The study characterized the department's 20-year old financial system as "cumbersome," generating "a paper blizzard and excessive red tape for over-burdened school employees." The department maintained that the school system could not focus on improvement efforts because its employees were spending too much time attending to paperwork.

The study recommended a new on-line, integrated computerized financial management system as the first goal of a six-point plan to improve and streamline the department's financial paperwork. The other five goals were to establish a comprehensive financial management training program; provide staffing and other resources for school offices; review and streamline financial policies, procedures, forms, deadlines, and reports; define roles and responsibilities of schools, offices, and staff; and develop a standardized and comprehensive coding structure.

The study was used as basis for a request for funds to begin development of a new computerized financial management system. The Legislature provided the initial funding for this project in the Supplemental Appropriations Act of 1988, appropriating $981,153 for fiscal year 1988-89 for software and staff.

The following year the department received $10,333,362 from the Legislature to continue the project. Of this amount, $7,544,935 was appropriated for fiscal year 1989-90, and $2,788,427 for fiscal year 1990-91. During the 1990 legislative session, the department made a supplemental request of $2,600,000 for fiscal year 1990-91 to cover additional costs to continue the project. The Legislature, however,

appropriated only $1,000,000 of that request. Appropriations for the FMS project by fiscal year are summarized in Table 2.1.

TABLE 2.1
Appropriations for the FMS Project

Fiscal Year	Appropriation
1988-89	$ 981,153
1989-90	7,544,935
1990-91	3,788,427
Total	$12,314,515

The department's management of the FMS project was first under the Office of Business Services, which conducted the initial study and developed the green book. After the project funding was received, the department transferred project responsibility to the newly formed Information Resource Management (IRM) group assigned to the Office of the Superintendent. The group's project manager reported directly to the deputy superintendent.

System Development Process

The department's system development process should be seen in light of that followed by the data processing industry in developing major computer systems. Four separate and distinct phases normally comprise the process: (1) analysis phase, (2) design phase, (3) construction phase, and (4) implementation phase. Within each phase are steps that must be completed in order to ensure a successful transition to the next phase or step.

Analysis phase

The first phase of any major computer system development process ensures that the needs of users are first identified and will be satisfied by the new system. The major steps are to identify, review, and document the needs of users in what is commonly referred to as a *requirements definition*. The requirements definition is essential to the successful development of a computer system. It serves as the foundation for all subsequent phases of development. A requirements definition should clearly and completely lay out user needs.

After all user requirements of the new system have been identified and reviewed, the next step is to prioritize them. Assigning a high, medium, or low priority to each requirement gives management the flexibility to control the timeframe and cost. High priority requirements are implemented first, medium and low priority requirements thereafter. This phased approach is critical to a project's success because attempting to implement *all* requirements simultaneously is normally too formidable and risky an undertaking for large systems projects.

In situations where a decision has been made to acquire and modify commercially available software, a request for proposal (RFP) incorporating the requirements definition is prepared and sent to interested software vendors. Vendor proposals are then evaluated for both compliance with the RFP and responsiveness to the requirements definition. Following the evaluation, a vendor's software package is selected.

Design phase

The main steps in the design phase are (1) to confirm that the user needs in the requirements definition are understood, since this is the foundation for the design; (2) to develop a general design for the system that meets user needs; and (3) to expand the general design into a detailed design. The general and detailed designs serve as "crosswalks" from the requirements definition, which is the foundation of the design, to the technical activities of programmers who code the software or make modifications to the software package.

Within the design phase are three checkpoints to ensure that system *users* and system *developers* are in complete agreement on the design: (1) confirmation and mutual understanding of the requirements definition, (2) agreement on general design, (3) agreement on the detailed design.

At the first checkpoint, users and system analysts review the requirements definition, gain a mutual understanding of the purpose of each requirement, and agree upon the requirement's priority. At this point, those who will be developing the system begin to formulate a clear understanding of what the users want. Users explain what they expect, and system analysts evaluate those expectations against their understanding of the system requirements and the technical complexities of the users' expectations. Once there is mutual understanding on the requirements definition, the general design can be framed.

The general design translates user requirements in the requirements definition into such technical products as the types of screens on

which to enter data, the reports to be generated, and the types of information the system will provide. A model or "picture" is developed that depicts the major processes within the system and this is accompanied by a narrative of what the internal processes will accomplish. For example, if a requirement for the system is to be able to compare budgeted expenditures to actual expenditures, the general design might show that the system would prepare monthly and year-to-date budget-to-actual reports of expenditures by object code and program code. Once the general design is completed and agreed upon, work can begin on the detailed design.

The detailed design is simply an expanded, more precise technical description of each report, process, or screen identified in the general design. The detailed design identifies such things as the location of information, process and data descriptions, edit and validation procedures, and other important pieces of information or data to be included in the system's report, process, or screen. In our example of a budget-to-actual report of expenditures by object code, the detailed design might describe where the necessary data can be obtained, and where that data and information such as report title, object codes, budget, and actual figures are to be located on the report. The detailed design will also show if the report is to include cents, commas, or dollar signs, be double or single spaced, and it will describe any calculations or algorithms necessary to present the information.

It is essential that the detailed design be agreed upon before the actual construction of the system begins. This is because the detailed design becomes the major part of the specifications that the computer programmers will follow when coding their programs to meet the defined requirements. Once the detailed design is completed and agreed upon and all requirements in the general design are included, system construction can begin.

Construction phase

In the system construction phase, computer programmers actually write or modify the software programs in computer language to produce the reports, screens, and processes agreed upon in the detailed design. The programs are also individually tested to ensure they operate as intended.

Testing is usually done at three levels during this phase. The first level of testing is called the *unit test*. The second level is called *integration testing*, and the third level is the *system test*. Each level of testing is necessary to isolate and identify problems. Unit testing identifies problems within individual software programs; integration testing identifies problems with the interface of software programs within a sub-system; and system testing identifies problems with the interface of sub-systems within the system as a whole.

Once the system has been fully tested and those responsible for the construction of the system and the review of test results are satisfied that the system operates as it was defined in the detailed design, the system is ready for acceptance testing and implementation by the users.

Implementation phase

The implementation phase begins when the new computer system is ready for the users to review and operate. This phase of the project includes acceptance testing, personnel training, implementation, and post implementation review.

During acceptance testing, the users test the system for a specified period of time to be sure that the system functions as it was expected to. At the same time, training is conducted so that all users will be able to work with the system after the acceptance testing is complete and the system fully implemented. Implementation of the system occurs when it is completely and satisfactorily installed and operating.

After the system has been operating for a complete cycle (which for financial systems is normally one complete fiscal year to include year-end closing of the accounting records), a post implementation review is conducted. The post implementation review formally documents the system development process from the analysis phase through the implementation of the system. The review will document problems and their resolution, lessons learned, limitations of the system, and any needed modifications.

Department's System Development Process

The FMS project is currently one year behind schedule. This delay from the planned implementation date has resulted in a $1,000,000 extension of an Ernst & Young contract. We describe here the phases of development that led to this situation.

The department's plan called for a standard system development approach similar to that described previously. The approach included the development of a requirements definition, general design, and detailed design. It also included phases for program coding and testing, acceptance testing, training and implementation.

Analysis phase

After the department adopted the green book's recommendation for a new computerized financial management system, it decided to acquire a commercially available software package. Through the competitive proposal process, the department selected the consulting

firm of Ernst & Young to help develop the requirements definition for the new system and to write the RFP for acquiring the software to run such functions as budgeting and accounting.

The department issued the RFP, which included the requirements definition, on February 17, 1989, with vendors' proposals due April 26, 1989. In May, Ernst & Young's contract was amended to have the consultant assist the department in evaluating the proposals.

Four vendors responded to the RFP, but only three agreed to make formal presentations. The department decided to go with a package presented by KPMG Peat Marwick (KPMG) and negotiated a contract for $1,660,315, which was signed on July 20, 1989. The KPMG financial management software package consisted of three integrated sub-systems: an accounting system, a purchasing system, and a budget preparation system. The contract required that KPMG modify these sub-systems to meet the requirements definition and all requirements of the department's existing budgeting system. The date for delivery was set at July 1, 1990, at which time acceptance testing and user training were to have been completed.

After selecting the software package, and anticipating the level of effort necessary in subsequent phases of system development, the department negotiated another contract with Ernst & Young for $1,554,000. The terms required Ernst & Young to verify whether KPMG's financial management software package and modifications conformed to specifications, to prepare user manuals, to produce training materials, and provide support to project management. The contract was signed August 3, 1989, and was to be completed June 30, 1990.

As a result of these contracts, three parties shared the responsibilities of the project. Department personnel were responsible for project completion and decision making, KPMG was responsible for system software, and Ernst & Young was responsible for preparing user manuals and training materials and advising the department on project management and technical matters.

Design phase

In August 1989, KPMG began work on the general and detailed designs. In October 1989, the department accepted KPMG's general design. However, two months later when KPMG delivered the detailed design, the department would not accept it. The parties could not agree on the scope of the system and its design, and in January 1990, KPMG stopped work on the project.

By February the department and KPMG reached a compromise in the interest of completing and implementing the system. The agreement included deleting the budget preparation component and reassigning

responsibilities for certain report programs. The agreement did not resolve all differences over the detailed design, but the department allowed KPMG to proceed, with the understanding that differences would be resolved during the next phase of the project.

Construction phase

Immediately after the compromise was reached, KPMG computer personnel began programming and testing software modifications at their data center in Sacramento, California. Only limited development occurred on site at the IRM group office. The department had no choice in this off-site arrangement because the software package it selected required an operating system that was not yet available within state government.

On June 30, KPMG delivered to the department what it believed to be the fully tested FMS software, along with the system test results. After reviewing the results, however, the department concluded that KPMG's system test was not complete, that certain system features performed differently from what the department expected, and that some test results were incorrect. KPMG did not agree. It took the position that the tested system software was complete and that it had met its contractual responsibilities for this phase, exclusive of warranty requirements. The department then decided to conduct its own system test, using KPMG's assistance only when necessary to fix problems the department's tests identified.

At the end of our fieldwork in August 1990, the department was still conducting its own system test. By September 1990, we were informed that it had completed system testing and that users had begun acceptance testing.

Implementation phase

In the department's plan, the implementation phase was to have begun in April 1990 with acceptance testing. By July 1, 1990, training was to have been completed and the system placed in operations. However, as we were informed at the end of November, the department would not be able to complete its acceptance testing until December 1990. Pilot testing at five schools began in November--months behind schedule. User training is scheduled to begin in January 1991. Hardware and telecommunication installation in the schools and training centers began in July 1990 and will continue through March 1991.

Data conversion for all schools and administrative centers is now scheduled to begin in February 1991 and continue through June 1991, with the new system going "live" July 1991, one year after the planned implementation date.

Financial Status of the Project

Appropriations for the FMS project total $12.3 million over the past three fiscal years, 1988-89 through 1990-91. Of this amount, $11.2 million has been allocated to the IRM group for the project. The IRM group expended $7.7 million (see Table 2.2) from September 1988, through August 1990, and had $3.4 million remaining of its 1990-91 allocation.

Table 2.2
Expenditures for the FMS Project
September 1988 through August 1990

Personnel costs	$ 541,970
Computer and office equipment and supplies	2,235,566 [1]
KPMG Peat Marwick	1,218,803 [2]
Ernst & Young	3,150,278
Office lease rent	161,883
Other	395,427
Total to August 31, 1990	$ 7,703,927

Sources: Department of Education Schedule of Expenditures by Subdivision reports and IRM group records

1. Does not include balances owed under various installment purchase agreements.

2. Does not include $441,512 balance owed on KPMG contract.

In addition to the amount allocated to the IRM group, the department has transferred $216,282 to the Information and Communications Division (ICSD) of the Department of Budget and Finance to cover the costs of mainframe computer support for the project, and $600,000 to the department's Information System Services Branch to develop the budget preparation system originally intended to be part of the FMS project but dropped in the compromise. We understand that the $3.4 million unexpended balance of the 1990-91 allocation will be used to pay for consulting services, equipment purchase agreements, and other operating expenses. The IRM group expects to expend all of the funds.

Major cost items

The major cost items for the FMS project are consultant contracts, computer equipment, and facilities for the IRM group. Consultants contracts amounting to $4.8 million include $1.66 million to KPMG Peat Marwick for the FMS system software and installation. Ernst & Young contracts and amendments have amounted to $3.15 million for services that include the development of the requirements definition and the RFP up to the most recent amendment, but they do not include the cost of project equipment paid for through Ernst & Young.

The department has paid, or has commitments to pay, more than $2,700,000 for computer equipment and software. This includes more than 300 personal computers and monitors, and more than 300 laser printers. It also includes the cost of a mid-range computer and telecommunications equipment and software.

The department has also leased and furnished a two-story office facility for the Information Resource Management group at a cost of more than $300,000. The cost includes lease rent, new furniture, telephone lines, and other normal occupancy costs.

Cost to complete

At the conclusion of our fieldwork in August 1990, one of our tasks was to assess what it would cost to complete the FMS project. Although the department expects to spend the $3.4 million unexpended balance for the project, we could not ascertain whether this amount is sufficient for successful completion. This is because the system was still in system testing, and the department was still in the process of documenting system capabilities. Until the delivered system is understood and documented, its shortcomings are identified, and the level of effort necessary to make the modifications is determined, the cost of completing the implementation cannot be reasonably ascertained.

Our recommended course of action to implement the FMS is discussed at the end of Chapter 3 and includes a task for estimating the cost to complete the system implementation.

Chapter 3

Shortcomings of the FMS Project

In Chapter 2, we reported that as of August 1990 the financial management system (FMS) project is delayed at least one year. This delay and the lack of understanding of the system's status and capability have resulted in the underutilization of training facilities, the purchase of hundreds of personal computers for a system that is not yet operational, additional costs for consulting services, and an inability to reasonably estimate the cost of completing the project.

Here we discuss what we believe were shortcomings in the development process that led to these problems. Normally, we would recommend corrective action for each finding. The FMS project, however, is beyond the point where past shortcomings can be corrected. For the department, we instead propose a prudent course of action to complete the implementation of the FMS project. Our findings can best be viewed as pitfalls to be avoided in the future.

Summary of Findings

1. The department selected an unproven system software package that was not compatible with existing systems operating within state government.

2. The requirements definition was not complete.

3. Critical checkpoints in the development process were bypassed.

4. Personnel of the Department of Education were not involved in essential stages of system programming and testing.

5. The department engaged in improper procurement practices. It circumvented competitive bid requirements, did not solicit competitive proposals for consulting services, and did not follow applicable administrative directives.

Selection of Software Package

The department originally planned to purchase a commercially available software package that had been successfully implemented in other jurisdictions. The RFP specified that vendors' products must conform to the standards and requirements of the

Department of Budget and Finance's Electronic Data Processing Division (now known as the Information and Communication Services Division, or ICSD).

The department selected a software package that (1) had not been successfully installed in a business environment, in either the public or private sector, and (2) was not compatible with the systems that the State had at the time. Because of these two conditions, the risk associated with implementing a new financial management system was high. While we acknowledge that the selected software represents advanced computer technology and concepts, we believe its selection was imprudent.

We note that after the software evaluation process ended on June 13, 1989, the FMS Steering Committee recommended that a proven version of KPMG software be selected by the department. This older software package had been successfully installed in ten states and in the largest state department of education in the country. It operated in a technical environment supported by the State. The department, however, still chose to proceed with a new, yet-to-be-proven version of KPMG software.

Software was unproven

Selection of a software package that has been implemented successfully in another governmental unit will minimize the risk associated with the system's implementation. A history of successful implementation ensures that the software works in a "real world" environment, that the vendor has experience modifying and customizing the system to meet client needs, and that system errors have been minimized, if not eliminated.

In acquiring a package that had not previously been implemented, the department became the first installation site (commonly known as the "BETA" site) for the financial management system. The risk involved with a BETA site installation is enormous, and implementation normally is far more time-consuming than subsequent system installations.

Without the benefit of prior experiences, estimates of effort and time needed to modify software to meet requirements are simply "best guesses." System errors, or "bugs," are more likely to be found when software is installed. Consequently, there is no guarantee a BETA installation will succeed. And even when a BETA installation is successful, it will often have taken two to three times the effort and time needed to implement proven software.

Software was incompatible with existing state systems

The software package selected by the department was designed to run on an advanced, state-of-the-art, database management system called DB2. At the time it made the selection, this technology was not installed in the State's data processing center. That meant that FMS could not be run at State facilities until the State acquired the DB2 system software and trained personnel in its operations.

Because DB2 was not installed at State facilities, a decision was made to carry out system modifications at KPMG facilities in Sacramento. As a result, almost all system development, modification, and testing were performed at a location and facility outside the department's direction and control. This was contrary to preferred practice in the industry.

Later, once DB2 was operational and state staff trained in its operation, the whole FMS system software had to be reinstalled and retested on the State's mainframe computer. At the end of our fieldwork in August 1990, there were two copies of the FMS system software under development, one in Sacramento and one at the ICSD. This situation was also contrary to the preferred practice of having only one copy of system software that is undergoing development and change.

It would have been far more desirable to install, develop, modify, and test the financial management system at the site where the system would eventually operate. Doing so would have facilitated the transfer of knowledge from KPMG to both users and technical support personnel and would have also eliminated the time-consuming task of transferring the system from Sacramento to Honolulu at a late stage of the implementation process.

Requirements Definition

As we discussed earlier, the requirements definition serves as the foundation for all subsequent phases of systems development. A requirements definition should be complete. It should be so clear about user needs that no requirements are subject to different interpretations. The FMS requirements definition included with the RFP was a list of 1,300 prioritized requirements, of which the vast majority were given the highest possible priority. This made the document somewhat suspect.

We believe a requirements definition should, at a minimum, contain the following:

- brief description of each requirement
- priority assigned to each requirement
- description of how each requirement is being satisfied by the existing system
- explanation of how each requirement relates or interfaces with other requirements
- discussion of the benefits associated with implementing each requirement
- narrative detailing the intent of each requirement
- note on the frequency of use (daily, weekly, monthly, quarterly, or annual) of each requirement

The FMS requirements list included in the RFP contained only the first two elements and was, by industry standards, incomplete.

The consequence of the requirements definition being incomplete was that, from the beginning, the department and KPMG had difficulty first defining the scope of the system and then agreeing on it. They often differed in their interpretations of requirements and user intent. They had divergent ideas of what was to be within the scope of the FMS software. These scope issues still existed at the end of our fieldwork.

In time, the lack of a clearly defined and agreed upon requirements definition severely hampered development of the general and detailed designs. KPMG struggled to produce a detailed system design document that successfully addressed its understanding of the requirements contained in the requirements definition. In many instances, the department's expectations differed markedly from KPMG's, to the point where KPMG believed the department's expectations were not those contained in the RFP.

These differences in perceptions gave fuel to misunderstandings and led ultimately to the severe disagreements over system requirements that resulted in KPMG issuing a "stop work" order to its staff. The order was to hold until all scope issues associated with the new system could be resolved.

Critical Checkpoints in Design Phase

As described in Chapter 2, the design phase of a project contains three critical checkpoints. Two of these checkpoints are (1) at the beginning of the analysis phase when requirements are confirmed and agreed upon prior to beginning design, and (2) at the end of the design phase when the detailed design is agreed upon before construction begins. Bypassing a checkpoint is not wise. It is particularly unwise to bypass a checkpoint simply because an agreement cannot be reached. During the FMS design phase, both of these critical checkpoints were bypassed.

The first critical checkpoint the department bypassed was that of coming to a mutual understanding of the requirements definition. The design phase should not have been allowed to begin until requirements were *clearly defined and understood by all parties concerned.* We believe the department would have identified and obtained the information missing from the requirements definition had the necessary review and agreement taken place. Also, this checkpoint could have been used to reexamine the large number of high priority requirements, identify which of them were really critical to the system, and possibly reassign some requirements a lesser priority.

The second critical checkpoint bypassed was that of agreeing on the detailed design. The actual programming and modifications of system software should not have begun until the detailed design had been agreed upon and formally approved by the department. There were two factors contributing to the parties' inability to agree on the detailed design. First, there was no agreement on the requirements definition, and second, there was no agreement on the format and content of the detailed design document.

Passing these two checkpoints is essential to the successful development of a new computer system. We cannot stress too heavily that bypassing them will almost certainly lead to misunderstandings and disputes. This, of course, is what happened. KPMG was permitted to begin programming and testing system modifications without clearly defined and agreed-upon requirements and without concurrence on many detailed design issues. As a result, an unexpected system was delivered, which the department did not accept.

Involvement of Department Personnel

Department of Education personnel were not involved in the essential stages of programming and testing. As a result, they were not in a position to support and maintain the system following delivery.

The department's original plan was to take over the operation and maintenance of the new financial management system following the system test. At that time, KPMG's contractual responsibilities for the software, except for warranty, were to be fulfilled. Since the department was to be solely responsible for the system's operation and maintenance, it was imperative that its personnel be knowledgeable in the use, operation, and capabilities of the modified software package. To gain this knowledge, department personnel would need to be involved in all phases of system development.

However, few, if any, department personnel were involved during the programming and testing tasks. The programming of software and the unit, integration, and system tests were conducted by KPMG personnel in Sacramento, with limited telecommunication hook-up at the IRM group facility. If department personnel had been involved during these tasks, they would have been familiar with the system and in a better position to support and maintain it following KPMG's delivery of the tested software. In addition, if the department had been able to identify and correct problems in Sacramento, additional system testing might have been unnecessary.

Had department personnel been more closely involved during these steps, they would have learned what the system could do, why the system functioned as it did, and how the software operated. This knowledge would have been invaluable to the department, particularly after the department decided to conduct its own system test. Involvement of its personnel during programming and testing might have enabled the department to identify problems that otherwise went unnoticed by KPMG at Sacramento. As it was, the department received the KPMG-tested system without having the necessary personnel available who thoroughly understood it.

The lack of understanding became a critical issue when the department rejected the KPMG system test and conducted its own system test. The department's personnel had to educate themselves on the system's capabilities as they were conducting the test. This caused their system and acceptance testing to take far longer than planned.

Procurement Practices

During our review, we found the department engaged in improper procurement practices. The department circumvented competitive bid requirements by making purchases through one of its consultants, acquired consultant services without soliciting competitive proposals, and did not comply with administrative directives in making hardware and software purchases.

Circumvented competitive bid requirements

Competitive bid requirements are governed by Section 103-22, *Hawaii Revised Statutes*, which states that a public advertisement for sealed bids is required for expenditures of $8,000 or more ($15,000 or more after April 17, 1990). Section 103-22 also says that expenditures should not be divided or parceled so as to defeat or evade bid requirements. The purpose of competitive bid requirements is to prevent favoritism and to obtain favorable prices from the lowest responsible bidder.

The department circumvented this requirement by making purchasing arrangements through one of its consultants on the FMS project. Invoices for these purchases flowed through the consultant. Payments amounting to $298,222 were made to Ernst & Young as reimbursement for equipment and services purchased for the department's IRM group office. Equipment and services purchased were $36,013 for office furnishings, $238,717 for computers and software, and $23,492 for installation of computer cables.

Ernst & Young is not in the business of purchasing assets for its clients. In this case, it acted as a conduit for the flow of invoices for the purchases.

Acquired consultant services without soliciting competitive proposals

To obtain consultant services to develop the requirements definition, the RFP, and the FMS software, the department used the competitive proposal method of procurement. Under this method, a request for proposal is sent to several consultants. Proposals from those who respond are then evaluated on pertinent factors such as price, experience, method of approach, and staffing. This method is especially advantageous for procuring professional services because it allows for competition among providers where price is not the only evaluation factor.

The department, however, did not use the competitive proposal method when it obtained subsequent consultant services for independent verification and validation, training, and other support.

Instead, the department contracted with Ernst & Young for $1,554,000 and amended the contract a year later for a revised amount of $2,554,000. In this instance we believe it would have been prudent to use the competitive proposal method of procurement because of the significant cost involved, and because there are several private sector consulting firms that specialize in these tasks, particularly the independent verification and validation of computer systems.

Did not comply with administrative directives

The governor's Administrative Directive 77-2 deals with the State's policy on electronic data processing services. It gives the Director of Finance the authority and responsibility for controlling the acquisition of computer hardware and software. Administrative Directive 87-1 establishes policies and responsibilities for acquiring and utilizing telecommunications services and facilities within the executive branch.

Both directives were written so as to provide a consistent and cohesive direction for statewide data processing and telecommunications. They require that purchases of computer and telecommunications hardware and software be approved by the Director of Finance.

The department has purchased personal computers, software, a mid-range computer, and telecommunications hardware and software for the FMS without obtaining the Director of Finance's approval for these purchases as required by the administrative directives.

Recommended Course of Action

The current status of the FMS project is that the department is conducting acceptance testing and pilot testing. The next step is to conduct training and allow users time to learn the new system. For most users, the training step will be the first time they see how the requirements they requested actually work. In view of the misunderstandings that have occurred thus far, we believe users will find other instances when the system will not function as expected.

The severest, and most important, test of the system will be the full system implementation scheduled for July 1, 1991. At this stage, all users will begin to operate the software in a "live environment," and the department will be relying on the FMS to provide all its accounting and purchasing recordkeeping.

The system will be connected to more than 200 schools and administrative offices, all accessing live data on a shared basis. The

initial, full-scale implementation of a new system of this size is very important. If the system does not work as expected, or works incorrectly, the department-wide impact would be immediate and serious. The risk to department operations should be minimized before the system is fully implemented.

Based on the shortcomings of the project, we believe the risk of the system's not functioning properly upon full implementation is much higher than it should be. Action needs to be taken to minimize that risk. We recommend the following course of action.

Step One

It is critical to the success of the FMS project that the department have a solid understanding of the capabilities of the KPMG software package and its modifications. This includes not only an understanding of what makes up the system, (programs, subroutines, and data) but also an understanding of how to operate the system. Also important for the department is to fully understand the users' needs so that critical requirements can be identified.

For this understanding to be a reality, two events must take place. First, the department must work closely with all parties to understand what has been delivered by KPMG and how the system is meant to operate. The emphasis should not be on how the delivered software *should* operate by the department's standards, but on how it *does* operate. Second, the department must go back to the requirements definition and decide which of the 1,300 requirements are truly critical to the success of the initial implementation of the FMS. It should then reassign priorities for implementing the requirements.

Once these two events have taken place, the department will possess the knowledge necessary to match the users' critical requirements and subsequent design against the software's capabilities. At this point, if scope issues still exist, they can be addressed and resolved and the definition of the critical system components can be developed.

Step One is complete when the parties agree on what capabilities exist in the delivered FMS software, what critical requirements must be in the initially implemented system, and, therefore, what capabilities still need to be added to or modified within the software prior to implementation.

Step Two

A detailed project workplan which defines the length of time, level of effort, and estimated costs necessary to accomplish the remaining tasks identified in Step One must be developed. We recommend that budgeted hours be assigned to each task and that actual hours worked

be reported against the budget. We also recommend that regularly scheduled status reports be provided on a task-by-task basis. In summary, what is required is a detailed workplan which will track actual versus budgeted tasks, costs, and timeframes.

We recommend that all work on the system be done at the IRM group office in Honolulu using the software installed at ICSD. No further work should be done in Sacramento. We also recommend that all parties involved in the implementation, including ICSD, meet on a regular basis to discuss the status reports, develop solutions to problems, and adjust the workplan when necessary.

Step Two will be complete when there is an agreed upon, detailed project workplan that describes how the project will progress through implementation.

Step Three

Also critical is to redefine, or clarify, project responsibilities. It is important to make certain that all parties involved understand which party is responsible for specific tasks. We recommend that they start with the original contracts, and any subsequent amendments, to clarify areas of responsibility. Any additional clarification of responsibilities should be documented.

Step Three will be complete when the parties involved agree on who will be responsible for the remaining tasks. This should include procedures for signoff and acceptance to avoid further misunderstandings about whether or not a task has been completed.

Chapter 4

Student Information and Program Management System

This chapter presents a brief history of the student information and program management system (SIPMS) project. It also describes the status of the SIPMS project and its relationship with the financial management system (FMS), discusses estimated project costs, and presents recommendations to the department.

History of the SIPMS

In August 1988, the department recognized a need to make information on students and instructional programs more accessible at the state office, district office, and schools. The department initiated a study to document the information needed at each of these levels, describe the information that was not provided by the existing systems, and recommend solutions for improvement. The results of the study were presented in the *Student Information and Program Management System: A Study*, commonly referred to as the "brown book," dated December 1988. This document, prepared with the assistance of IBM, identified existing problems, recommended changes, and addressed the benefits to be derived from a new system. The study recommended a seven-phase project to be installed in 10 years at a cost in excess of $100 million.

One of the department's objectives was to provide a "dynamic" student and program information system which integrates with personnel, financial, and outside agency databases. The department decided to implement a student information and program management system to combine student information requirements with program information. The student information portion of the system would be designed to "capture," monitor, and report such items as student test scores, absentee records, and special program requests. The program management system would keep track of the programs offered to the students and eventually match students with programs.

The department's request for $3.26 million for SIPMS for the 1989-91 biennium was turned down by the Legislature. Its supplemental budget request for $361,000 in 1990 was also turned down. However, after the department asked for assistance, the Department of Budget and Finance (B&F) agreed to fund the

development of a preliminary project plan and a system requirements definition. B&F contracted with Data House, Inc. to perform these tasks.

Project Status

Data House, Inc. has delivered two documents to the department as required by its contract: (1) *Preliminary Project Plan for the SIPMS* (draft dated March 19, 1990 and updated October 1990), and (2) *SIPMS System Requirements Definition* (final draft dated August 3, 1990).

The preliminary project plan contains a discussion of the methodology to be used for the development of SIPMS along with estimated timeframes and cost estimates for software development, equipment, consulting, and personnel costs. Because of the complexity of SIPMS, the plan proposes a phased, or staged implementation approach. The plan concentrates on the first stage, which is the student information portion of the project. This stage is estimated to take six years and $23.8 million to complete.

The requirements definition is consistent with the project plan for the first stage of the project. Data House, Inc. developed the definition for the student information portion of the project using significant input from those who would be using the new system. The requirements definition contains (1) a detailed requirements analysis, capable of assisting the decision makers in the department to better understand the desired features of the system, and (2) a detailed discussion of the significance of using a structured methodology for approaching a system implementation effort of this size.

The requirements definition appears to be comprehensive and in accordance with the system development methodology described in the department's Distributed Information Processing and Information Resource Management (DIPIRM) plan. It has ranked the system functions and requirements, and prioritized the functions and subfunctions of the proposed system. It should serve as a good foundation for subsequent phases of the SIPMS project.

Relationship Between FMS and SIPMS

The financial management system project and student information and program management system project are being administered separately. The department's Information Resource Management group is responsible for the FMS project, and the department's Information System Services Branch is responsible for the SIPMS project. We believe that any coordination between the two projects is a result of project management's initiative, rather than a result of

planning. While there is awareness between projects, there is no formal communication or coordination of efforts between the two projects.

The FMS project team indicated that one of its goals is to satisfy the future hardware and software needs of schools, administrative centers, and training centers. This goal includes the hardware needs of the SIPMS project. The SIPMS project team has begun to consider the savings that could result by using the hardware and software that will already be in the schools and administrative centers as a result of the FMS project.

In the future, improvements in communications and planning among the department projects is needed. The department should determine the potential of the two systems sharing their resources. The department's most recent DIPIRM begins to address the need for system implementation efforts to utilize existing technical capabilities. We encourage this effort as a way to get maximum benefit from money allocated to projects.

Estimated Costs for the SIPMS

The preliminary project plan estimates costs of $23.8 million and a six-year timeframe for the first stage of the SIPMS project. Total project costs are now only best estimates. More refined cost estimates can be developed as specific system needs are defined and the development is finalized.

We believe that, with the defined scope of the first stage, a one year timeframe for requirements confirmation, software package selection, and software installation is a conservative but realistic estimate. A timeframe of one year for the design phase, to include development of the general design and a detailed design for a system this size, is also realistic.

Cost estimates of $3.3 million for this two-year effort to finalize system requirements, select and install a software package, and design the modifications to the software package appear realistic.

System construction and implementation costs are further in the future and depend heavily on the software package selected and the extent of modifications needed. Therefore, we cannot comment on the $20.5 million cost estimates for those future years.

Recommendations to the Department

Continue phased approach

The SIPMS project plan shows three distinct stages to be implemented. The first stage is to develop the student information portion. The second and third stages are to develop the instructional services and program management portions of the project. This phased approach should be continued to minimize risks and increase the likelihood of timely, cost-effective implementation.

It should be noted that the first stage has a six-year timeframe for completion, with implementation at selected schools being phased in during the third or fourth year. We believe this is the proper approach for a project of this size.

Consider existing equipment and software

As the SIPMS project is developed, it should take into consideration the computer equipment and software put in place as part of the FMS project. Using equipment and software already in place will reduce project costs and facilitate implementation of the SIPMS project.

Chapter 5

Guidelines for Legislative Review

Here we propose general guidelines for the Legislature in reviewing requests for funding of such major computer systems as the student information and program management system (SIPMS).

We believe that a legislative review should not be limited to the initial request for funds. It should be ongoing. It should span the system development process and end only when the system is fully operational and has become part of the agency's routine. Our guidelines for review are therefore twofold. They cover (1) the review of the funding request, and (2) the requirements for status reports to the Legislature during system development.

The review of the funding request has two objectives: first, to assure the Legislature that the requesting department or agency has identified its needs, evaluated alternatives, and selected the best course of action, and second, to provide assurance that the department or agency has a reasonable workplan and cost estimates for achieving the desired outcome. The objective of requiring status reports is to allow the Legislature to monitor the progress of major computer system projects.

Review of Request for a Major Computer System

The initial request for funding of a major computer system should be accompanied by a report justifying the need for the system. The report should contain a description of problems with the existing system, an analysis of alternatives, a project workplan, and cost estimates of implementation. It should be written in language a lay person can understand. In reviewing the report, the Legislature should look for the following information:

- *Overview of the existing system.* The overview describes the system currently in place at the department or agency.
- *Discussion of problems with the existing system.* This section describes the problems with the existing system and provides the rationale for a new system.
- *Analysis of alternatives.* This section should identify and evaluate alternative ways of dealing with the existing situation then propose the best course of action. It should justify why the proposed course is the best alternative.

- *Discussion of the goals of the new system and description of project organization.* The report should describe the goals of the new system, both long and short term. It should then set forth how the project will be organized to achieve those goals.

- *Workplan for the system development process.* This section should include a fairly detailed workplan that lays out the timeframe and resources necessary for each of the system development phases: analysis phase, design phase, construction phase, and implementation phase.

- *Cost estimate.* This should estimate what each phase will cost. The estimates should be classified by major cost category: for example, consultants, system software, system hardware, and so forth. Cost estimates should include the recurring costs of maintaining the system that the State must incur.

Review Annual Status Reports

Because major computer systems often take several years to implement, ongoing legislative review will be aided by annual status reports. These should be mandatory until the new system is fully operational and has become part of the day-to-day routine of the department or agency. While each computer system will have different characteristics, certain basic information will hold the same and should always be part of the status reports.

Status reports should at a minimum (1) compare the implementation status of the project to the workplan and explain any variances; (2) discuss problems encountered and their actual or intended resolution; (3) describe major shifts in direction or major changes in plans; (4) breakdown the actual costs to date; and (5) breakdown the estimated costs to complete.

Response of the Affected Agency

Comments on Agency Response

We transmitted a draft of this study to the Department of Education on December 14, 1990. A copy of the transmittal letter to the department is included as Attachment 1 of this Appendix. The response from the department is included as Attachment 2.

The department concurs generally with our recommendations and acknowledges that certain areas could be improved. However, the department does not agree with some of our comments regarding the financial management system (FMS) project. It feels that the report did not present a complete picture and therefore fosters incorrect impressions of project management. It says that problems are not uncommon with large and complex projects like FMS and that the problems do not automatically infer project mismanagement.

ATTACHMENT 1

STATE OF HAWAII
OFFICE OF THE AUDITOR
465 S. King Street, Room 500
Honolulu, Hawaii 96813

(808) 548-2450
FAX: (808) 548-2693

C O P Y

December 14, 1990

The Honorable Charles T. Toguchi
Superintendent of Education
Department of Education
1390 Miller Street
Honolulu, Hawaii 96813

Dear Mr. Toguchi:

Enclosed are three copies, numbers 7 to 9, our draft report, *Study of the Development of the Department of Education's Financial Management System and Student Information and Program Management System.* We ask that you telephone us by Wednesday, December 19, 1990, on whether you intend to comment on our recommendations. If you wish your comments to be included in the report, please submit them no later than Friday, December 28, 1990.

The Chairperson of the Board of Education, Governor, and presiding officers of the two houses of the Legislature have also been provided copies of this draft report.

Since this report is not in final form and changes may be made to it, access to the report should be restricted to those assisting you in preparing your response. Public release of the report will be made solely by our office and only after the report is published in its final form.

Sincerely,

Newton Sue
Acting Auditor

Enclosures

JOHN WAIHEE
GOVERNOR

CHARLES T. TOGUCHI
SUPERINTENDENT

STATE OF HAWAII
DEPARTMENT OF EDUCATION
P. O. BOX 2360
HONOLULU, HAWAII 96804

OFFICE OF THE SUPERINTENDENT

RECEIVED
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OFC. OF THE AUDITOR
STATE OF HAWAII

December 28, 1990

The Honorable Newton Sue
Acting Legislative Auditor
Office of the Auditor
465 South King Street, Room 500
Honolulu, Hawaii 96813

Dear Mr. Sue:

Thank you for this opportunity to respond to the audit report, "Study of the Development of the Department of Education's Financial Management System and Student Information and Program Management System."

Before responding to the individual findings and recommendations in the report, we would like to make a few global comments regarding the overall tone of the report. We feel that the report does not present a complete picture because it omits key information which fosters the incorrect impression that: the department does not know what it is doing, that most project problems are the result of poor department decisions, and that the FMS software will not meet the needs of the department. Through our comments, we hope to provide some of the missing information which will allow a more balanced evaluation of the circumstances and decisions that have been made by the department. As a start, we feel it is important for the Governor and Legislature to understand that:

- Project problems do not automatically infer project mismanagement. The Financial Management System (FMS) project has had many developmental problems. But such problems are not uncommon with projects as large and as complex as FMS. While this fact does not minimize the importance of the salient points of the audit findings, it does help to prevent an unfair conclusion being reached regarding the management decisions that have been made by the Department of Education.

- Decision making involved a large number of informed and interested parties. Contrary to what is being portrayed, decisions were not made in a vacuum. Besides, in-house staff expertise, the department relied upon the advice and recommendations of experienced and qualified consultants, central agency staff, and a committee of user representatives including state, district and school personnel.

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AN AFFIRMATIVE ACTION AND EQUAL OPPORTUNITY EMPLOYER

- FMS project is meant to meet the present and future needs of the Department of Education. This meant that decisions could not always be limited to lowest risk or existing capabilities. Decisions also had to include future needs and other important technological and economical considerations to insure long lasting cost effective benefits to the department. Some of our prime considerations were to improve productivity and provide ease of use benefits to the various school personnel.

- Events beyond the department's control had a negative impact on the project. Some of the project decisions were made in response to key negative events that were beyond the control of the department. We believe that in such situations, the evidence of good management is the ability to change approaches and solve the problems at hand.

- The original implementation schedule for the FMS project will be met. The FMS project will be implemented in July 1991 (the date originally committed to the Legislature and specified in the RFP, Section II, paragraph 2.4). Funding from the legislature was also based on a July 1991 implementation. Although, the department knew that the July 1990 implementation date was ambitious, we decided to proceed with the July 1990 date because: 1) the vendor claimed that such an implementation would be possible; 2) the school/units needed the relief from their manual process as quickly as possible; and 3) it was felt that an early target date would help to insure implementation by July 1991.

- The department has diligently identified and managed its FMS requirements. All of the 1,300 requirements contained in the original RFP will not be incorporated in the system. Many have been found to be unnecessary with improved procedures, while others have been "traded" for newer more important requirements. With the current set of requirements, the FMS software will be the most advanced, state of the art, and easy to use software in the State of Hawaii.

- The schools are using the new FMS microcomputers today. The microcomputers that have been installed in the school/units are not under-utilized. PC applications such as PFS Professional File, PFS Professional Write and Local School Accounts are operational on the FMS workstation. School personnel, School Administrative Services Assistants and Account Clerks, that assisted in the development of the installation plan strongly recommended the early installation. They felt that it was very important to learn the use of the computer through PC applications prior to learning the on-line FMS applications. They felt it would ease the transition from where they are today, a manual environment, to the use of the PC and the implementation of FMS. The displaced DOS PC is now available for use by others at the school/unit location.

Attached are specific comments to the findings and recommendations in the audit report. We feel that these comments will demonstrate that the department acted in a reasonable and competent manner in implementing one of the most advanced computer applications ever introduced in the State of Hawaii.

We hope that through our response, we will be able to provide a better understanding of the extenuating circumstances associated with this large and complex project. The department is trying to exercise leadership to create innovative solutions for the many operational challenges that presently exist in the schools. It is very important that the DOE continues to receive legislative and administrative support to complete the implementation of the Financial Management System and to begin the next phase, the development and implementation of the much needed Student Information System.

The department would like to compliment the Auditor for a very constructive and informative report and to thank the audit staff for conducting their review in a very professional and business like manner. We concur with portions of the report that there are areas to improve to assure successful and satisfactory completion of the project.

If there are any questions, please have your staff contact Mr. Eugene Tanaka, of the DOE's IRM Office, at 548-8419.

Sincerely,

Kengo Tabata

for Charles T. Toguchi
Superintendent of Education

CTT:ET:pn

Enclosures

ATTACHMENT

The Department of Education's comments to the audit report, "Study of the Development of the Department of Education's Financial Management System and Student Information and Program Management System."

Shortcomings of the FMS Project

1. Report Comments: The Department selected an unproven system software package that was not compatible with existing systems operating within state government. The department should have stayed with a proven version originally selected by the Selection Committee.

Response: We agree that the use of DB2 did increase the implementation risk and made the project more complex. The decision to use the DB2 version of the STARS software was based on: 1) the assurance of the vendor that the DB2 version of the software was operational; and 2) the department's desire to use technology that would meet current and future needs and not be outmoded in a few years. The use of a Data Base Management System (DBMS) such as DB2 will provide a solid foundation from which to integrate other application systems. As a DBMS, DB2 also provides the foundation that greatly enhances accessibility of information across functional and organizational lines. Integration and accessibility were very high priority requirements stated in the original FMS study. Integration is essential if we are to provide the schools with the advanced systems they will need in the future.

We cannot accept the conclusion that the DB2 version of the software should not have been used because it was not available at ICSD. If future information technologies must be compatible with existing systems, how will the department ever introduce new, innovative, and more powerful advances in technology? Especially if the beneficiaries of such systems are the end users.

While the selection of a proven software package may have been the safer decision, the software would not have met the future needs of the department. Furthermore, adequate safeguards were negotiated in the event that the new software proved ineffective. The selection of DB2 was made with the understanding that the vendor would convert from DB2 back to VSAM (at no additional cost to the department) if there were any problem with the DB2 version. Also, the DOE was given two months to test the DB2 version of the software to confirm that the software was working. It was only after the completion of this test period did the DOE decide to go with DB2.

Finally, the allegation that the DOE unwisely selected an unproven software package over a proven software package does not match our understanding of the facts. The department made its selection between two software packages which had never been installed in a production environment. The Steering Committee originally selected STARS 3.0, a new, uninstalled version of the STARS software package. The version finally selected was R*STARS which combined the advances of STARS 3.0 with the relational data base technology of DB2.

The department was not interested in the older "proven" versions of STARS because of dated technology. For example, the State's accounting system FAMIS is a STARS product, and we knew it to be inadequate for our departmental needs. As such, the department never had the choice of turning down a "proven" package. Instead, the department felt it was in our best interest to select the one utilizing the relational data base technology.

2. Report Comments: The requirements definition was not complete.

Response: We believe that the requirements definition in the RFP was complete. In many cases, it contained much more than just the first two elements specified in the audit report. In our opinion, the real problem that should be cited by the audit report (regarding the lack of clearly defined and agreed upon requirements) is that despite numerous and vigorous protests by the DOE project personnel both in writing and in meetings, the vendor failed to follow a structured methodology. The lack of a structured methodology obscured the review and evaluation of the requirements in relationship to software capabilities.

Action: In the future, the department will insure that consultants absolutely follow the State's structured System Development Methodology (SDM/70 or equivalent) in all development efforts.

3. Report Comments: Critical checkpoints in the development process were bypassed.

Response: Checkpoints were not bypassed. Both the requirements document and the Detail Design Document (as amended by the review comments of the DOE) were accepted and approved. However, because the vendor did not follow a structured methodology, in some cases the Detail Design Document lacks the desired precision in the manner in which the software is to satisfy a particular requirement in the RFP.

Action: In the future, the department will insure that there are clearly defined and agreed to requirements prior to the movement into the design phase of development.

4. Report Comments: Personnel of the Department of Education were not involved in essential stages of system programming and testing.

Response: The department agrees that it should have been more involved in the programming and testing efforts. But the department could not commit the staffing that would have allowed meaningful involvement in this area. The report should have pointed out however, that many departmental people (including four analysts and programmers and six application integration specialists from the Accounting and Budget Offices) were actively involved in all other areas of the project development effort. The report also should have pointed out that programming and systems testing were not departmental responsibilities. As such, we applied our limited personnel resources to the project activities which were our responsibility before applying them to activities which were the responsibility of the vendor. Otherwise, we would not have met our obligations to the project.

The people on the project are very knowledgeable of all aspects of the FMS system. The bugs/defects in the delivered software, not the lack of involvement during the programming and testing efforts, dictated the need for the department to do an independent systems test. The identification of the bugs/defects were made by departmental personnel involved in the testing process. Even if the department were involved in the programming effort, defects are usually isolated during the testing phases. DOE personnel were involved in these phases. The bugs/defects also created a steeper learning curve for departmental personnel because the software was not performing as it should and the technical documentation was incomplete.

Finally, it was never the department's plan to take over the software maintenance of FMS following the systems test. The department is understaffed in the technical area. Attempts to get more staffing have not materialized in sufficient numbers of positions.

Action: In-house technical staff are becoming involved with the programs and programming aspects of the system. In-house staff have already written several of the conversion and interface programs and will soon be writing most of the report programs. In-house technical staff are positioned to support the daily operation of the system. Contractor services will be used to maintain the software during 1991 and 1992. The department has requested more positions in

the 1992-93 budget to position itself to assume the software maintenance responsibilities in 1993.

5. Report Comments: The department engaged in improper procurement practices. It circumvented competitive bid requirements, did not solicit competitive proposals for consulting services, and did not follow applicable administrative directives.

Response: Certain purchasing improprieties occurred which the department sincerely regrets. It should be clearly understood, however, that there was no favoritism of a particular vendor or company and no increased cost to the State.

The furniture and equipment that were purchased through a consultant contract were used to furnish and equip the IRM Office. The method of acquisition was used as a last resort because it was deemed vital to moving the project forward. After finally locating a suitable project office, there was too little time in which to get all of the necessary bidding and administrative directive approvals. Delay in the establishment of the project office would have resulted in a significant adverse impact to the project. Pricing checks were made to insure the lowest cost to the State. We believe that the auditors in their review substantiated that 1) the cost of the equipment and furniture were not excessive and 2) the consultant was merely used as a conduit for the acquisition and no profit was made by the consultant. It should be noted that all subsequent purchases were made in compliance with proper purchasing procedures.

The department did not consider competitive bidding for the extension of the E&Y contract because: 1) the department was pleased with the pattern of good service from the consultant; 2) consultant's service was dependable and, problems if any, were addressed promptly in a professional manner; and 3) there was a desirable level of knowledge and expertise that had been acquired by the consultant team which would not have been readily transferable to a new consultant.

If another consultant were selected it would have imposed added cost and time to the project. The department estimates that it would have delayed the project by three months and cost the state approximately $200,000 to $300,000 in extra consultant costs to bring a new consultant team up to the same level of project background and knowledge.

Finally, the original E&Y contract was openly reviewed by the Board of Education and subject to public review as part of the Board Of Education's review and approval process.

Action: The department assumed that the contract extension did not require competitive bidding because the contract extension involved a level of background and knowledge which could not be provided by any other consultant and were unique professional services which "did not admit of competition." On hindsight, this conclusion may have been incorrect. Please rest assured, however, that it is not the intent of the DOE to avoid the requirements of Chapter 103, H.R.S.

The department will remind its staff of the requirements under Chapter 103 so as to avoid future purchasing improprieties.

Study's Recommended Course of Action

Step 1. The study recommends that 1) the department work closely with all parties to understand what has been delivered and how the system is meant to operate and 2) the department must go back to the requirements definition and decide which requirements are truly critical.

Response: The conclusions of the auditor do not appropriately reflect the facts. The department understands the FMS software and the requirements of the project. During the systems and acceptance testing process, DOE personnel have developed a comprehensive understanding of how the software operates. Also, user groups made up of school, district and state office personnel have been involved in the prioritization of the requirements. The mutually agreed upon Dispute Resolution Process has been activated to help resolve future conflicts between the requirements definition and the Detail Design. Acceptance testing will be completed shortly and the system is scheduled to be implemented in production mode beginning in May 1991. We do not feel that there is a need to do step one.

Step 2. The study recommends finer project budgeting, conducting software fixes only in Honolulu, and having status meetings with all parties including ICSD.

Response: These are appropriate recommendations. The department has had status reporting in place since the beginning of the project, has attempted to have all software fixes performed only in Honolulu, and does involve ICSD.

Action: We will make extra efforts to continue to improve in all of these areas.

Step 3. The study recommends that all parties should agree to and understand project responsibilities.

Response: In addition to the Contract and Master Implementation Plan, the parties have in place a Contract Resolution Agreement which clarifies the responsibilities of each party.

Action: Responsibilities will be further clarified.

Relationship between FMS and SIPMS

- Report Comments: The Financial Management System (FMS) and Student Information System (SIS) projects are being administered separately. Any coordination between the two projects is a result of project management's initiative, rather than a result of planning.

  Response: FMS and SIS will be coordinated under one organization when SIS funding is approved and the department establishes the Office of Information Technology.

  Action: The projects will continue to be coordinated and managed as part of a larger plan to develop and install integrated information processing and communications technologies in the Department of Education.

- Report Comments: The department should determine the potential of the two systems sharing their resources. The department's most recent DIPIRM begins to address the need for system implementation efforts to utilize existing technical capabilities. We encourage this effort as a way to get maximum benefit from money allocated to projects.

  Response: The department agrees.

  Action: The department's overall plans for SIS call for the sharing of equipment and resources already in place, wherever possible.

Recommendations to the Department

- Report Comments: The phased approach should be continued to minimize risks and increase the likelihood of timely, cost-effective implementation.

  Response: The department agrees.

  Action: The department will continue its phased approach.

- Report Comments: As the SIS project is developed, it should take into consideration the computer equipment and software put in place as part of the FMS project. Using equipment and software already in place will reduce project cost and facilitate implementation of the SIS project.

  Response: The SIS plans and budget request reflect the multiple use and sharing of existing hardware and other resources.

  Action: The department's overall plans for SIS call for the sharing of equipment and resources already in place, wherever possible.

Guidelines for Legislative Review

- Review of Request for a Major Computer System

  We do not feel that departmental comments would be appropriate for this section. However, most of the problems associated with the FMS project were due to the vendor not responding to requests and concerns of project management. We therefore recommend that a timely process be established to allow projects like FMS to quickly resolve situations (through legal proceedings if necessary) whenever the vendor is not performing or does not respond to user requests, as specified in the contract in a timely manner.